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Prospect of Leaf Extracts on the Performance and Blood Profile of Monogastric – A Review

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ABSTRACT

Medicinal plants are used to prevent, treat and promote healthy life in human and animals, their medicinal value are due to the presence of bioactive chemicals or secondary metabolites (phytochemicals) making it more suitable for animals with benefits of low cost and total safety. Phytochemicals are chemical compounds that occur naturally in plants and they perform a multiple biological activities such as: antibacterial, antioxidants, anti-inflammatory, antioxidants, antifungal, hepato-protective, hypolipidemic and antiviral properties. The efficacy of phytochemicals in plants depends on their organic composition (tannin, flavonoids, terpenoids, saponin, phenols and alkaloids), method of extraction or processing, harvesting procedure, soil type, geographical location and level of maturity. Plants are also found to be loaded with minerals, vitamins and other nutrients needed for the growth and development of animals.

Keywords: Medicinal plants; leaf extract; phytochemicals; chemicals; nutrients.

INTRODUCTION

The huge increase in poultry production to meet the growing demand in Nigeria has led to the rise in antibiotic use, leading to a worrying increase in cases of antibiotic resistance diagnosed in animal and humans via direct contact, environmental contamination and food consumption, causing high cases of cancer and other ailments. According to NCI (2012), over 100 types of cancers affects humans, this negativity prompted the European Union (2006) to recommend other alternatives which are classified as natural growth promoter (NGPs). Among the potential alternatives are plants extracts (medicinal plants) which are safe, cheap and rich in various bioactive chemicals or secondary metabolites (Olafadehan et al., 2020; Oluwafemi et al., 2020; Alagbe, 2019). Most medicinal plants are also found to contain minerals, vitamins, amino acid and other nutrients (Olafedehan et al., 2019; Alagbe et al., 2020). In view of all this potential, plant extracts fall within the scope of European Union Regulation 1831/2003 and do not need any authorization to be included in livestock feed (Huyghebaert et al., 2011; Neeraj, 2016).

Bioactive chemicals or phytochemicals in plants performs various pharmacological effects in human and animal health as well as performs multiple biological activities such as antibacterial, antifungal, anti-inflammatory, anti-allergic, anti-helmintic, anti-allergic, hepato-protective, analgelsic, neuroprotective and immune-modulatory activities (Dhan et al., 2012). A medicinal plant also contains several constituents such as tannins, saponin, alkaloids, flavonoids, glycoside, phenols etc. These constituents in plants extracts varies from one plant to another, other factors are geographical location, soil type, age of plants, method of harvesting and extraction (Hyun et al., 2016). Phytochemicals are also proposed for use as antioxidants in animal feed, which will protect animals from oxidative damage caused by free radicals (Lillehoj and Lee, 2012) and are also regarded to have effect-enhancing and /or side effect neutralizing potential (Gilani and Atta, 2005). They are purified single chemical compounds (primary and secondary metabolites) present in the sap of naturally occurring plants and may possess some biological significance (Sethiya et al., 2009). Phytochemical component are responsible for both pharmacological and toxic activities of plant (lawal et al., 2015).

Many plant extracts have been reported to possess beneficial multifunctional properties and have been used as feed additives for farm animals (Neeraj, 2016). They have also been reported to stimulate the secretion if digestive enzymes and making nutrients available for absorption (Obajuluwa et al., 2020; Alagbe, 2019; Liu et al., 2012). Previous studies have shown that the gut microbiota plays important roles in host energy harvest, storage and expenditure, as well as overall nutritional status (Nicholson et al., 2012; Kim et al., 2011). Several plants extracts have also been combined to enhance the haematological and serum biochemical parameters in animals (Faluyi and Agbede, 2018; Alagbe and Oluwafemi, 2019).

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PHYTOCHEMICAL CONSTITUENTS IN PLANT EXTRACTS

Phytochemical constituents are makeup that confers strength to the plant and enables them perform multiple biological roles, such constituents includes:

Flavonoids

Flavonoids are known to possess antibacterial, antioxidant and antifungal activities (Saleem et al., 2005; Galeotti et al., 2008). Extracts from turmeric, garlic, garlic, Moringa olifera, lemon grass and Polyalthia longifolia protect cells against oxidative damage by scavenging free radicals (Babajide et al., 1999). According to Tsado et al. (2015), flavonoids have been suggested to perform anti-mutagenic and anticarcinogenic roles due to their anti-inflammatory and antioxidant properties.

Alkaloids

Alkaloids have been shown to have antibacterial, analgelsics and antiplasmodic properties (Faizi et al., 2008). Kasolo et al., 2010 and Ojewuyi et al. (2014) reported the role of alkaloids as an antimicrobial due to their ability to intercalate the DNA of microorganisms. Sexena et al. (2013) reported that alkaloids possess anti-hypersensitive, anti-malaria and anti-cancer properties.

Tannins

Tannins are known to possess both antibacterial (Enzo, 2007) and anti-viral activities (Adisa et al., 2010). According to Igboko (1983); Asquith and Butler (1986), plant containing tannins has been used traditionally for the treatment of wounds, diarrhea and hemorrhoids.

Saponin

They have been suggested to inhibit the growth of pathogenic organisms and function as an antimicrobial (Soetan et al., 2006; Sczkowski et al., 1988). Saponin modulates blood cholesterol, thus preventing cardiovascular disease and scavenging free radicals (Cheeke, 2000; Igidi and Edene, 2014).

Terpenoids

Terpenoids have been shown to have antimicrobial and anti-diuretic activity (Dubareva et al., 2004). Studies have also reported the beneficial effects of terpenoids on malaria and immune booster (Ngozi et al., 2017).

Phenol

Phenolic compounds have antimicrobial properties (Haruna et al., 2016) and prevent oxidative damage to biomolecules such as lipids, DNA and proteins (Ojewuyi et al., 2014).

Steroids

According to Tsado et al. (2015) steroids could be used in the stimulation of bone marrow, lean body mass, growth and prevention of bone loss among elderly men.

EFFECT OF LEAF EXTRACTS ON THE PERFORMANCE OF BROILER CHICKS

The growth performance of aqueous Moringa olifera (Lam) leaf was evaluated in 240 day old broiler chicks (Alabi et al., 2017). Birds were randomly distributed into six treatments with four replicates and each replicate containing 10 broiler chicks in a completely randomized design (CRD). Treatment one contained antibiotics, T2 has ordinary water while T3, T4, T5 and T6 contained Moringa leaf extract (AMOE) at 60, 90, 120 and 150 ml/liter respectively. The performance index of birds fed AMOE showed that birds fed 120 ml/ liter had the highest final weight and growth rate (2367.0 g and 52.99 g respectively) and the ones on 90 ml/ liter of AMOE had the lowest final and growth rate (2042.0 g and 45.37 g respectively). Results on feed intake showed that birds on antibiotics had the highest had the highest (84.70 g) and the ones on 90 ml/liter of AMOE had the lowest (73.19 g). Feed conversion ratio indicated that birds on 90 and 120 ml/ liter performed better than birds given antibiotics. Similarly, birds on AMOE had similar dressing percentages though that of antibiotics was highest (94.93 %) and the experiment lasted for 6 weeks.

The effect of dietary supplementation of plant extracts on the performance of broiler chicks was reported by Tekeli et al. (2014), One –day old (105) male broiler chicks (Ross 308) was used for an experiment which lasted for 42 days. The birds were divided into seven treatment groups of 15 birds each and randomly assigned to seven treatment diets in a completely randomized design. Treatment 1 (T1) contained (basal diet), T2 (basal diet + 10 mg flavomycin/kg diet), T3 (basal diet + 120 mg Yucca schidigera extract/kg diet), T4 (basal diet + 120 mg Oreganum vulgaris essential oil/kg diet), T5 (basal diet + 120 mg Thymus vulgaris essential

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oil/kg diet), T6 (basal diet + Syzygium aromaticum essential oil/kg diet) and T7 (basal diet + 120 mg Zingiber officinale essential oil/kg diet). The overall performance index was recorded among birds in T2 with highest final weight (2641.64 g) and carcass weight (1978.1 g) respectively followed by T7 (2554.54 g) and (1956.3 g) respectively. Animals in T1 had the lowest final weight (2403.0 g) and carcass weight (1730.25 g) respectively. It was concluded that Z. officinale could be used as an alternative to antibiotics in order to bridge the gap between food safety and production.

Studies on feeding green tea and Pomegranate Extract on the performance of broiler chickens (Vera et al., 2020). A total of 480 1-day-old ROSS 308 male broiler chickens were randomly allocated to two experimental groups of 12 pens each at a stocking density of 20 birds/ pen. Each experimental room housed six randomly distributed pens per treatment. Experimental treatments consisted of including (treated, T) or not including (control, C) a plant extract (PE) in the drinking water at a dosage of 2 mL/L. Treated birds received PE from 0 to 4 days of the trial and on days 10, 11, 20, and 21, corresponding to the beginning of the trial and the start of the second and third feeding phases. PE was included in one graduated tank for each pen to determine water intake during the treatment period. The PE was composed of green tea leaves (Camellia sinensis) and pomegranate rinds (Punica granatum) (IQV-10-P01, InQpharm Animal Health, Kuala Lumpur, Malaysia). PE did not affect performance and water intake, while total antiradical activity was improved ($P < 0.05$). It was concluded that PE administration during critical moments of the production cycle of broiler chickens may exert beneficial effects at a systemic level and on gut microbial ecology.

Hilal and Canan (2015) reported the effect of different levels of Turmeric (Curcuma longa) supplementation on broiler performance, carcass characteristics and gut microflora of broiler chickens. A total of day-old 350 chicks (175 male and175 female) of Ross 308 were randomly distributed into 7 pens. The study was conducted with 7 groups (1 control, and 6 treatment groups) each of which included 50 chicks. Each group consisted of 5 sub-groups and each replicate contained 10 birds (5 male and 5 female). The birds in control group was fed with basal feed, and the birds in treatment groups were fed with the basal diet containing turmeric powder at a rate of 2, 4, 6, 8, 10 g/ kg, respectively, and the bird in positive control group was fed with the basal diet containing a single dose of 10 mg/kg antibiotics throughout the experiment which lasted for 42 days. The results revealed that adding 10 g/kg turmeric powder to the ration significantly decreased feed intake (FI). Meanwhile, adding 2 g/kg turmeric powder improved feed conversion ratio (FCR). Neither carcass yield nor weights of heart and liver organs were significantly affected by dietary treatments. The colony forming unit of lactic acid bacteria was found to be higher in the group of birds fed on the diet supplemented with 2 g/kg turmeric powder than the other groups of birds. While the highest E. coli content was determined in the birds received control diet and those received the diet added with 10 mg/kg antibiotic, the lowest E. coli content was determined in the groups of birds fed with the diets added with 6, 8 and 10 g/kg turmeric powder. It was concluded that, increasing dietary supplementation levels of turmeric powder, except for the 10 g/kg level has positive effects on bird's performance and gut micro flora.

EFFECT OF LEAF EXTRACTS ON THE BLOOD PROFILE OF BROILER CHICKENS

Obikaonu et al. (2011) studied the haematological and serum biochemical indices of starter broilers fed neem (Azadirachta indica) leaf meal. A total of one hundred and fifty (150) one day old broiler chicks (Anak), birds were divided into five groups of 30 birds each and randomly assigned to the five experimental diets. Each group was sub-divided into 3 replicates of 10 birds each in a completely randomized design. Neem leaf was included in the broiler diet at 0, 2.5, 5.0, 7.5 and 10 % level respectively. Haematological parameters measured include: Pack cell volume (PCV), red blood cell (RBC), haemoglobin (Hb), white blood cell (WBC) and its differentials while those of serum biochemical analysis are albumin, globulin, cholesterol, uric acid and some serum electrolytes. Result obtained revealed that the haematological values were significantly reduced (($P < 0.05$) but were within the physiological range recommended for birds. Similarly, serum parameters follow the same pattern, however, cholesterol, alkaline phosphatase, alanine transaminase and aspartate transaminase values depressed as the level of neem increased ($P < 0.05$).

Kassa et al. (2016) examined the effect of dietary inclusion of different levels of *Lepidium sativum* (GCS) seed powder on the hematology and serum biochemical parameters of broilers. GCS was included in the ration at 0 (0GCS), 0.75 (0.75GCS), 1.50 (1.5GCS) and 2.25 % (2.25GCS) in each treatments, the experiment lasted for 42 days and all hematological parameters were within the normal range. However, inclusion of GCS improved ($p < 0.05$) hemoglobin, packed cell volume and red blood cell count. Group consumed GCS containing ration exhibited significant decrease in serum glucose, triglycerides and cholesterol concentration. It was concluded that Inclusion of GC up to 2.25 % result in no any adverse effect on the health of broilers. Based on the production parameters used in the study, GC can be included as feed additive at a level of 0.75 % in the total ration for better and positive results on biological performance and health status of broilers.

Shetiwa and Taha (2018) investigated the impact of the dietary inclusion of ginger powder *(Zingiber officinale)* on the growth performance, immune response, slaughter traits, blood biochemistry and gut morphology of broiler chickens. 20 broiler chickens were randomly selected into two treatment groups

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identified as T1 and T2 with a positive control and a negative control group. Each treatment contained with five birds. Birds on T1 were treated with 1% ginger extract and T2 was treated with 2% ginger extract via drinking water. Significant variations ($p<0.05$) was observed between the control and other treatments in mean final body weight, dressed weight, daily feed intake, feed conversion ratio and the blood parameters. At the end of experiment (35th day) for 1% ginger extraction treatment the live body weight is 1746gm ($p<0.05$), dressing weight 1106.4 ($p<0.05$) and FCR is 1.67($p<0.05$). The usage of the test ingredients had a significant effect ($p<0.05$) on dressing percentage.

Table 1: Types and effect of some plant extract used in poultry production

Plants	Parts used	Constituents	References
Daniellia oliveri	Leaf (aqueous extract)	Alkaloids, flavonoids, phenol, saponins, tannins, oxalate	Olafadehan et al. (2020)
Garlic	Garlic (aqueous extract)	Allicin	Mohammed et al. (2016); Elagib et al. (2013); Cho et al. (2006)
Turmeric	Rhizome	Curcumin	Hanan (2016); Kumari et al. (2007); Mehala and Moorthy (2008)
Piliostigma thonningii	Leaf (aqueous extract)	Alkaloids, saponin, tannin, flavonoids and steroids	Alagbe et al. (2019)
Phyllantus amarus	Leaf	Flavonoids, tannins, phenols, alkaloids	Ologhobo and Adejumo (2015); James et al. (2009); Sunddaresan et al. (2007)
Azadirachta indica	Leaf	Flavonoids, tannins, phenols, alkaloids, saponin, azadiratin	Esonu et al. (2000); Akpan et al. (2008)
Cymbopogon citratus	Leaf	Flavonoids, tannins, phenols, alkaloids	Alagbe and Oluwafemi (2019); Alagbe et al. (2019)
Indigofera zollingeriana	Leaf	Flavonoids, tannins, phenols, alkaloids, oxalate	Alagbe and Oluwafemi (2019)
Pakia biglobosa	Leaf	Flavonoids, tannins, phenols, alkaloids	Alagbe (2019)
Luffa aegyptiaca	Leaf	Flavonoids, tannins, phenols, alkaloids, saponin, oxalate	Alagbe (2019)

CONCLUSION

The use of leaf extract is now gaining recognition due to the complete ban on antibiotics in poultry feed by the European Union in 2006 and because they are effective, cheaper and pose no health hazard, in fact, they are used to bridge the gap between food safety and production. Plants are loaded with phytochemicals which makes them useful in pharmacological activities. They also ensures that they perform multiple biological activities. Rates (2001) reported that out of about 250, 000 – 500, 000 plant species estimated by WHO, only a small percentage has been investigated phytochemically and even a small percentage has been properly studied in terms of their pharmacological properties giving room for more prospects in research and production.

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